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ABSTRACT

A brief overview of the Computer Aids to Teaching Project is first presented. The workshops, seminars, demonstrations and open house events conducted in the course of the project are described, and the information services provided are discussed. An outline of the project's first workshop designed to introduce users to the PLATO IV computer-assisted instructional system is included, along with instructions on how to operate a computer terminal. Lastly, a brief article reviews the development, current status and future potential of ARPANET, a geographically distributed network of different computers interconnected by a communication system based upon high speed message switching. (LB)

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Computers And Teaching

An Interactive Newsletter

1
DEC.
1972

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Northwestern University - Computer Aids to Teaching project

WHAT IT'S ABOUT

The *Computer Aids to Teaching project* is officially in operation. Though the equipment required to interface with PLATO-IV will not arrive until late in January, we are now "talking" with the CDC 6400 at Northwestern. Workshops begin in January, and you are reading the first of our "participatory" newsletters.

A quick run down the 5 W's (who, what, when, where, why) should give you an idea what we're about...

WHO

Computer Aids to Teaching is produced and directed by Jim Schuyler, who, as director of the project, is responsible for its day-by-day operation. The project is administered jointly by the *Center for the Teaching Professions* and *Vogelback Computing Center*. CAT is funded by a General Electric Foundation *Educational Incentive Award*, through September of 1973. Principal investigators are Ben Mittman (director of the Computing Center) and Claude Mathis (director of Center for the Teaching Professions). You may contact any of us for information.

WHAT

The Educational Incentive Award provides funds for computer terminals and for a Director and Graduate Assistant. Three Hazeltine-2000 (CRT) terminals and a Texas Instruments 725 (printing) will be connected to Northwestern's computer. Though we are not limiting their use, we expect them to be used primarily with TUTOR or BASIC languages. The PLATO-IV plasma-display, with touch-panel, slides and audio, will arrive in January. It will be connected to PLATO-IV at the University of Illinois, in Urbana, Il., by a leased phone line (until a Chicago-area concentrator is available).

WHEN

The workroom (see enclosed map) is open whenever someone with a key is present, which means roughly 9am to 6pm, Monday thru Friday, plus other unscheduled hours. Terminals may be "reserved" in advance for demonstrations.

The schedule for workshops and seminars is given on a separate page.

WHERE

CAT is located primarily in room E1-316 of the School of Education, 2003 Sheridan Road, Evanston, Il 60201. Evanston, for those of you who don't know, is directly north of Chicago, Illinois.

WHY

This is not a trivial point. Primarily, we feel that the development of PLATO-IV and its inevitable spread into the field of education must be investigated and evaluated by Northwestern before we can make a valid decision on whether to adopt its technology for our classes. Since our investigation should yield plenty of data other colleges and universities will find useful, dissemination of our findings (in the form of a final report, also called

EM011 666

Computers and Teaching) is an important aspect of the project. We are exploring not only the hardware problems of computers but the concomitant "human" problems which will be raised as PLATO and his friends move into the real world.

EDUCATIONAL OFFERINGS

Several educational experiences are being planned for the year. We need feedback to help decide what types of programs should be presented at each. Please review this list and mark your preference on the return card...

Workshops: These are participatory offerings with no academic credit. You get "hands-on" experience with the LINGO or PLATO-IV systems. They should be good introductions for faculty or students. First workshop will be from 2pm to 5pm, January 8 & 9 (Monday and Tuesday), 1973. Second and third workshops to be held in March and May. Mark your preference of dates on the return card. A set of behavior objectives for the first day's session is included in this newsletter to give you some idea what will transpire.

Seminars: For credit (if desired). The E70-Seminar in College Teaching is a general Graduate School seminar, good in any department. Jim Schuyler will coordinate participants in an E70 exploring the relationship of computers to education, during the Winter quarter. E70 will begin with participation in the January 8/9 workshop. In addition, a Spring quarter E70 will explore advanced topics in depth -- like response-checking, compilation vs. interpretation, communications, or the technology of teaching. Faculty and students may sit in on one or more of these sessions, or take the series for one course-credit. Please mark the return-card if you would like a copy of the tentative syllabus for E70.

Demonstrations: We do not know whether the PLATO-IV terminal will be portable, so most PLATO demonstrations will probably be held in our workroom. The Hazeltine-2000's, however, are portable, and we may be able to arrange demonstrations in classrooms which have telephone connections. We definitely will arrange demonstrations for you, or for groups of people, in our workroom at the School of Education. Please call 492-3621.

Open-house: Although our workroom is always open to visitors, we hope to encourage frequent visits by holding informal open-house days. Our first will be the mornings of January 8 & 9 (the workshop days), when we will have coffee, talk, books and demonstration lessons available from 9am to noon.

FEEDBACK

To make this an interactive newsletter, some feedback loops are being planned. The first is in the form of a return-card, stapled to the back of the newsletter, which you may fill out and return to us. Your comments will be printed in the next letter if you mark the "please print" box. You may mail the card, use campus mail, or just drop it into the C.A.T. mailbox on the first floor of the Ed School building.

The second feedback loop involves invited "articles". If you have some experiences you feel may be of benefit to our readers, we invite you to write a one or two-page article for publication (first in the newsletter, then in the final report). We appreciate illustrations as well as text. The final report should read like a "whole earth catalog" for uses of Computers in Education. See the enclosed article on ICCC and the ARPANET as an example.

Additional feedback loops will use the computers themselves. An ORACLE group will be initiated on the CDC 6400 at Northwestern. (Instructions for entering the CAI system are included in this newsletter.) The ORACLE group will allow you to comment on each of the articles in each newsletter, or to reply

as you would on our return-card. And ORACLE lets you enter your own thoughts about topics we have not raised -- to get feedback from other ORACLE users.

A paper explaining how ORACLE can aid the feedback process, and telling how ORACLE is written, is available from C.A.T.

INFORMATION SERVICE

CAT offers a number of "services" which may directly help you in your C.A.I. activities. First, the ENTELEK C.A.I. Exchange, is kept in the project office. The Exchange provides 3x5 card records which describe C.A.I. lessons and installations across the U.S. You may use the Exchange to list your own programs too. A number of "library" books about C.A.I. and associated educational topics will also be kept at the project office.

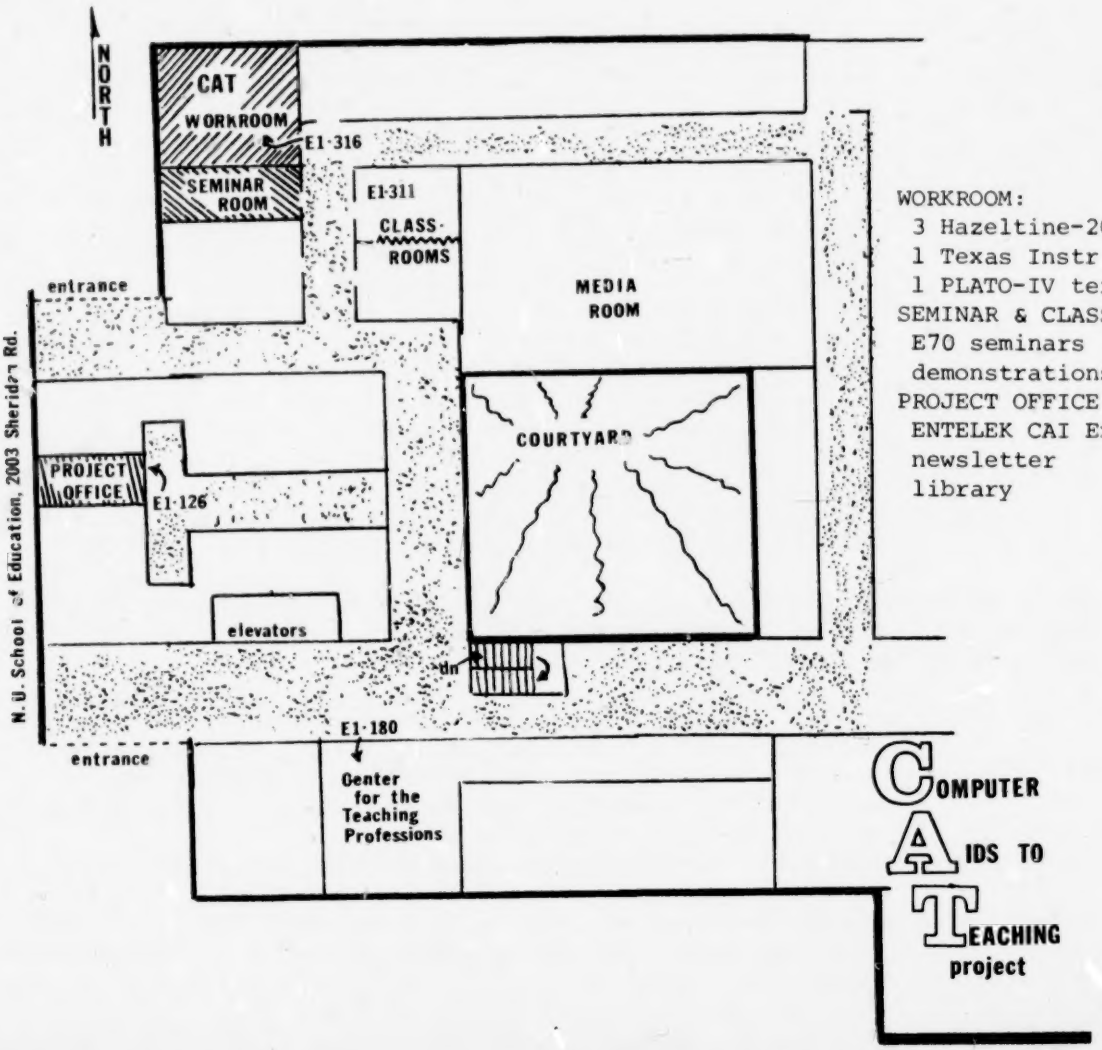
And in addition, if you are looking for inside or outside sources of financial support for your C.A.I. activities, we will help you with proposal review and provide information about potential sources as we receive it.

We will keep a set of the latest publications from both PLATO and TICCIT (the MITRE Corporation's C.A.I. system) in our workroom and project office.

And, if we have the time, we will help with routine debugging and programming problems related to PLATO or LINGO.

Let me personally extend a welcome to you- please visit us this month to see what we're about.

Jim Schuyler



WORKROOM:
3 Hazeltine-2000 CRTs
1 Texas Instr. 725
1 PLATO-IV terminal
SEMINAR & CLASSROOMS:
E70 seminars
demonstrations
PROJECT OFFICE:
ENTELEK CAI Exchange
newsletter
library

Computers And Teaching
Northwestern University - Computer Aids to Teaching project

WORKSHOP FIRST-DAY OUTLINE...

A two-hour introduction to PLATO-IV

Some behavioral objectives:

1) At the completion of the two-hour session, students will be able to list the four major components of the PLATO-IV student terminal and explain how they might be used in producing computer-aided-instruction lessons.

Plasma-panel: An internal-memory (gas discharge), non-flickering display unit with character and line generators. The character memory may be loaded by the computer at any time, permitting language changes and extended graphics. The panel is the basic presentation medium for lessons, on which all text is written. Because of the character capabilities, it can be easily used for foreign languages, fruit-fly labs, chemical formulas, mathematical symbols, etc. The line-generators make it possible to graph information easily, and even to produce animations.

Touch-panel: Senses the presence of the student's finger or another object as it nears the plasma-panel, digitizing the coordinates (line,character) of the object. A beep is emitted when contact is sensed. Can be used for students who cannot spell, as they may then touch the correct answer on the screen (in pictorial form, if desired).

Slide projector: Up to 256 "slides" may be available in microfiche form for each lesson. Fiche are distributed to students before they use a terminal. Any one of the 256 pictures may be selected by the computer in 1/10th of a second and projected on the back of the plasma-panel, along with other computer-generated information. Used in many lessons to provide pictures, or to present information which does not change from student to student.

Audio unit: Pre-recorded messages on a small recording disk may be randomly accessed under computer control. In combination with the touch-panel and graphics, this may obviate any need for use of the typewriter-like keyboard. Audio may also be used for foreign-language drills, since the computer can also record what the student says and play it back.

2) At the completion of the session, students will be able to list at least four of the following interactive teaching techniques and explain what they look like to the student at a terminal.

Drill & Practice: The simplest- problems are presented to the student one at a time. As each is solved, the next is presented. Used primarily in conjunction with other teaching methods. Not used much for actual teaching. Patrick Suppes' work at Stanford is an example.

Programmed Instruction: Problems and new information are presented in very small steps. Fill-in-the-blank and multiple-choice questions are used to test and reinforce. Used for teaching, seldom for review. B.F. Skinner is the best-known proponent.

Tutorial: The computer responds to the student's mistakes by changing its teaching strategy or "branching" to new materials. Sometimes called "intrinsic programming" after Norman Crowder, who proposed it.

Inquiry: The student asks questions of the computer, which responds with further questions or actual answers. Sometimes looks very much like a "dialogue" between tutor and student. This is much like information-retrieval in many cases.

Simulation: The computer plays the part of another system. Student tries to guess (or figure out) how that system is functioning, or how to deal with it. Used primarily by those who feel that "discovery" learning is valuable. The CASE medical patient-simulation is an example.

3) At the completion of session each student will be able to recognise the following "commands" (which may be given to PLATO) and explain their function in a typical lesson. 10 out of 14 correct identifications will be acceptable.

WRITE- Puts information on the screen of the terminal.

ARROW- Plots an arrow and waits for the student to respond.

ANSWER-Checks the student's answer against a pre-determined answer. The answer may be judged "right" or "wrong" (OK or NO) or a request for re-entry may be made.

SPELL- The teacher may tell PLATO to check for mis-spellings.

VOCAB- The teacher may insert a "vocabulary" of synonymous or ignorable words.

UNIT- The lesson is planned in terms of small "units" or frames (in the programmed-instruction sense).

AT- The teacher may position writing or graphics anywhere on the screen.

TOUCH- The lesson stops and waits for the student to touch the screen at this point. Much like an ARROW.

TERM- When the student presses this key he is given a "definition" of the term he types.

SLIDE- The indicated slide is selected and displayed.

RANDOM-"Random" number generators make it possible to generate sets of different problems for each student.

HELP- When the student presses this special function key, he may be branched to remedial or "help" units.

CHAR- Author-defined characters may be named and later plotted.

CALC- Complicated arithmetic expressions may be evaluated.

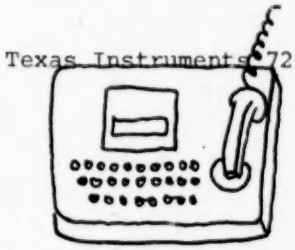
TURNING IT ON...

There are a few simple things you must do to run a computer-terminal...

1. Take the cover off the terminal, if it has one, plug it in and be sure it is turned on. Sometimes a terminal has two "on" positions, usually called LINE and LOCAL modes. The LINE mode lets you communicate with the computer. Be sure the acoustical coupler is also on.

2. Pick up the nearby telephone and dial 7081 (130-7081 from Chicago campus, or 492-7081 elsewhere). If the computer is busy, hang up and try again in a few minutes. If there is no answer, hang up and try later. When the computer does answer, you will hear a high-pitched "scream", indicating that the computer is ready. This noise will continue throughout your interaction. Place the telephone handset into the "cradle" of the acoustical coupler as shown below...

Hazeltine-2000



Texas Instruments 725

Some terminals, like the 725, have their own built-in couplers. It is important that the cord-end of the phone point in the correct direction -- most couplers are marked to indicate the right end.

The computer should type TERMINAL IDLE at this point. If it does not, first ensure that both terminal and coupler are on, that the terminal is in LINE or ON-LINE mode and that the phone is still connected to the computer and "screaming". If everything looks ok, but nothing was typed, ask for help immediately.

3. Now indicate your account number, name and class by typing them. Account number is two letters, four digits, a dash and four more digits. Use your first and last initials, a dash, and your class number (if any). Suppose my charge number were XX0000-0000, my name Jim Schuyler, and my class E70...

XX0000-0000,JS-E70

is what I would type.

IMPORTANT: From now on, every time you finish typing a line, you must press the "carriage return" key, to tell the computer you've finished. When the computer prints the next question mark, you may begin typing answers to its questions, but not before then. Carriage return is sometimes called "return", or "cr" or "xmit".

Did you press CR after typing your course number? (You should have!)

4. If you correctly entered the account number and your initials, the computer will print some short messages and eventually say

CONTROL CARDS:
?

You then type (exactly as follows)...

CAI. (be sure to use CR)
%EOR (be sure to use CR)

5. These two lines are called control-cards, and they tell the computer to enter the compuater-aided-instruction subsystem. CAI will ask for your student ID number (if you forgot, or don't have one, just type any number), your name (you may fake this) and the type of terminal you're using (Hazeltine or 725 or Teletype). *You may use a fake name if you like, but the computer will use it to identify you in the future, so use the same number and name each time you enter the system.*

6. Finally, the computer will ask you what lesson you want to run. Type its name, or type LESSONS to get a list of available lessons. Instructions on how to write your own lessons are in the LINGO manual, available from Vogelback Computing Center, Evanston campus.

ARPANET

On October 24 thru 26 I had the experience of meeting a group of about 800 Computer Philosophers in Washington. At the same time, I met the military/industrial complex head-on! The occasion was the first International Conference on Computer Communication. First, the philosophers: among the papers presented at the conference were some truly dull, uninteresting reports as at any conference. But a surprising number of "thought" papers found their ways into the proceedings. For example, the session at which I talked had a paper on computers as communications tools in educational systems, governmental systems, interrogation of experts and in air-traffic control. The main concern of the panel moderator turned out to be man-to-man communications (which I agree is the major problem) rather than the computer problems, or the communication link's problems. It seems that for once, computer people were able to get together and consider the end user of their systems. Other papers covered such topics as "measuring impact on organizational structure", "Some social-psychological dimension of the public's perception of the computer", and the whole question of individual privacy.

On the military/industrial side of the river, I learned much more, and this is really the whole point of the article. For what I saw in actual operation was the ARPANET. For those of you who do not know much about ARPANET, this is the printed introduction given at the conference...

The ARPANET is one of the more advanced examples of a computer communication network. It consists of a geographically distributed set of different computers, interconnected by a communication system based upon very fast response (interactive) message switching. The ARPANET has demonstrated the feasibility of message-switching technology, illustrated its advantages and fostered the development of techniques for computer-to-computer communication.

A primary goal of the ARPA Network is to permit persons and programs at one center to access data and interactively use programs that exist and run in other computers of the Network. Computer and other resources of the various centers are thus pooled and directly accessible to the entire community of Network participants.

In designing the Network, ARPA has built a new kind of digital communication system employing wideband leased lines and message switching, a store-and-forward system, wherein a path is not established in advance and each message carries an address. Small identical processors, called IMPs (Interface Message Processors), produced by Bolt Beranek and Newman, are placed at each Network node, connecting each computer center, or Host, to a system of leased 50-kilobaud common-carrier circuits.

The ARPA Network has grown during the past three years to over 30 Sites with over 40 independent computer systems connected.

For the ICCC72 conference, a Terminal IMP (called a TIP) was installed in the hotel, and connected to the ARPANET. About 30 terminals, teletypes, CRTs, graphics processors, etc. were hooked to the TIP, and were used to communicate with BBN's TENEX system, Stanford Research Institute's Network Information Center (Menlo Park, Ca), the MULTICS system, and others. Though the TIP didn't work too well, when communication had been established, the demonstration did prove that ARPANET is a feasible network of high-powered computers.

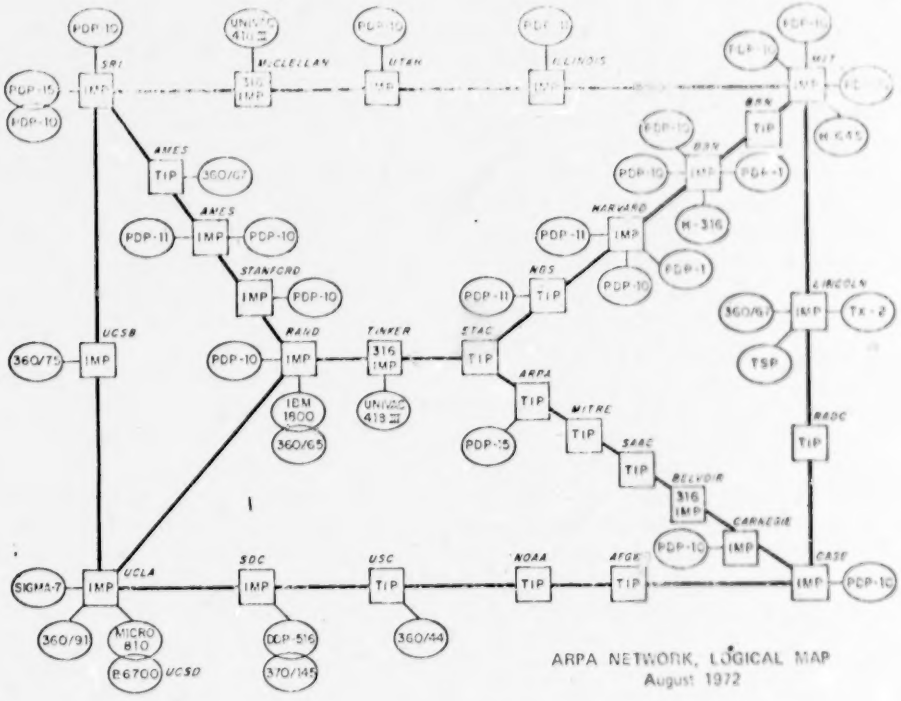
I was unable to find out how potential IMP or TIP sites are chosen. As you can see from the map on the next page, the ARPANET is heavily balanced toward the DOD/University complex, which seems only natural, given its source of support, ARPA.

The question one has to ask, of course, is whether the proposed National Science Network (NSN), to be constructed by the National Science Foundation (NSF) will be founded on ARPANET, and whether it will be able to perform the democritization necessary

to open up computer resources to large and small colleges alike. ARPANET has definitely proven the feasibility of a nationwide computer net; will NSN be able to diffuse the net so that it reaches enough people to really count?

ARPANET and National Science Network are two topics to keep your eye on because someday people are going to try to use the plasma-panel and the PLATO-IV terminal on these networks. And immediately, someone will get the bright idea that perhaps ARPANET should be hooked directly into the teaching systems - into PLATO-IV. Will we be ready for instant "global" communication systems?

Jim Schuyler



ARPA NETWORK, LOGICAL MAP
August 1972

SERVER SITES

IDENT	HOST	COMPUTER	ORGANIZATION
AMES-67	16	360/67	NASA Ames Research Center
BBN-TENEX	69	PDP-10	Bolt Beranek and Newman Inc.
CASE-10	13	PDP-10	Case Western Reserve University
CMU-10A	78	PDP-10	Carnegie-Mellon University
CMU-10B	14	PDP-10	Carnegie-Mellon University
HARV-10	9	PDP-10	Harvard University
ILLIAC	15	PDP-10	NASA Ames Research Center
LL-67	10	360/67	M.I.T. Lincoln Laboratory
LL-TX2	74	TX-2	M.I.T. Lincoln Laboratory
MIT-AI	134	PDP-10	M.I.T. Artificial Intelligence Group
MIT-DMCG	70	PDP-10	M.I.T. Dynamic Modelling and Control Group
MIT-ML	198	PDP-10	M.I.T. Mathematics Laboratory
MIT-MULTICS	6	H-645	M.I.T. MULTICS Group
SDC-ADEPT	8	370/145	System Development Corporation
SRI-AI	66	PDP-10	Stanford Research Institute, Artificial Intelligence Group
SRI-ARC	2	PDP-10	Stanford Research Institute, Augumentation Research Center
SU-AI	11	PDP-10	Stanford University, Artificial Intelligence Group
UCLA-CCN	65	360/91	University of California at Los Angeles, Campus Computing Network
UCLA-NMC	1	Sigma 7	University of California at Los Angeles Network Measurement Center
UCSB-MOD75	3	360/75	University of California at Santa Barbara
UCSD-CC	129	B6700	University of California at San Diego
USC-ISI	22	PDP-10	University of Southern California Information Sciences Institute
UTAH-10	4	PDP-10	University of Utah

TIPS AND USER SITES

IDENT	HOST	COMPUTER	ORGANIZATION
ALOHA-TIP	163	TIP	Aloha Network, University of Hawaii (Schedule
AMES-TIP	144	TIP	NASA Ames Research Center
ARPA-TIP	156	TIP	Advanced Research Projects Agency
BBN-NCC	5	H-316	Bolt Beranek and Newman Inc.
BBN-TESTIP	158	TIP	Bolt Beranek and Newman Inc.
DOCB	153	TIP	Department of Commerce, Boulder
ETAC-TIP	148	TIP	USAF-ETAC
GWC-TIP	152	TIP	Air Force Global Weather Central
HARV-11	137	PDP-11	Harvard University
ILL-ANTS	12	PDP-11	University of Illinois
MITRE-TIP	145	TIP	MITRE Corporation
NBS-CCST	19	PDP-11	National Bureau of Standards
NBS-TIP	147	TIP	National Bureau of Standards
RADC-TIP	146	TIP	Rome Air Development Center
RAND-RCC	7	360/65	Rand Corporation
SAAC-TIP	154	TIP	Teledyne Geotech, Seismic Analysis Array Center
USC-44	23	360/44	University of Southern California

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FEEDBACK CARD:

Please indicate what you want clearly. Fold on the dotted line and return to C.A.T. in campus mail, U.S. mail or in person.

☐ Send me the ORACLE paper.

☐ I am interested in writing a one or two-page article for Computers And Teaching. Title or subject might be

_____

☐ For the March and May workshops, I prefer these dates and times ...

_____

☐ Send me _____ copies of the E70 syllabus when printed (in time for Winter).

Add these people to the CAT mailing list right now !

Comments or feedback on articles or on CAT in general...

☐ Please do not print my comments.

☐ You have my permission to print these in a FEEDBACK column of the next newsletter.